CLAIMS

1. Apparatus for measuring an arrival time of a photon, said apparatus comprising:

a photocathode operable to emit an electron when struck by said photon;

a sensor disposed to detect said electron emitted by said photocathode; and

an electric field generator operable to generate an electric field to accelerate said electron emitted by said photocathode toward said sensor; wherein

said electric field generator is operable to generate an electric field varying with time such that said electron is incident upon said sensor with an arrival energy dependent upon said arrival time of said photon; and

said sensor is operable to provide an output signal indicative of said arrival energy.

2. Apparatus as claimed in claim 1, wherein said sensor is a CCD sensor operable to store a charge dependent upon said arrival energy.

3. Apparatus as claimed in claim 2, wherein said CCD sensor comprises a plurality of pixel cell detectors, different pixel cell detectors being operable to measure a respective arrival energy of an electron corresponding to a photon incident upon said photocathode.

4. Apparatus as claimed in claim 3, wherein each pixel cell detector upon which an electron has been incident outputs a signal dependent upon said arrival energy.

5. Apparatus as claimed in any one of the preceding claims, wherein said electric field generator is operable to generate a voltage difference between said photocathode and said sensor which changes with time starting from a trigger point.

6. Apparatus as claimed in claim 5, wherein said voltage difference is a periodic signal.

7. Apparatus as claimed in claim 6, wherein said periodic signal has a frequency of between 0Hz and 1000Hz.

8. Apparatus as claimed in any one of the preceding claims, wherein said electric field generator is operable to generate a voltage between said photocathode and said sensor of between 5kV and 10kV.

9. Apparatus as claimed in any one of the preceding claims, comprising an attenuator disposed to attenuate photons arriving at said photocathode.

10. Apparatus as claimed in any one of the preceding claims, wherein said photons have a wavelength between 10nm and 1000nm.

11. Apparatus as claimed in any one of the preceding claims, wherein said photocathode and said sensor are formed as a sealed structure substantially having a vacuum between said photocathode and said sensor.

12. Apparatus as claimed in any one of the preceding claims, wherein said apparatus is a fluorescence lifetime imager.

13. Apparatus as claimed in any one of claims 1 to 11, wherein said apparatus is a detector for a time-of-flight measurement of photons for non-invasive IR imaging.

14. Apparatus as claimed in any one of claims 1 to 11, wherein said apparatus is a single shot time correlated single photon counter.

15. A method of measuring an arrival time of a photon, said method comprising the steps of:

emitting an electron from a photocathode struck by said photon;

generating an electric field to accelerate said electron emitted by said photocathode toward a sensor; and

detect with said sensor said electron emitted by said photocathode; wherein

said electric field varies with time such that said electron is incident upon said sensor with an arrival energy dependent upon said arrival time of said photon; and

said sensor provides an output signal indicative of said arrival energy.

16. A method as claimed in claim 15, wherein said sensor is a CCD sensor operable to store a charge dependent upon said arrival energy.

17. A method as claimed in claim 16, wherein said CCD sensor comprises a plurality of pixel cell detectors, different pixel cell detectors being operable to measure a respective arrival energy of an electron corresponding to a photon incident upon said photocathode.

18. A method as claimed in claim 17, wherein each pixel cell detector upon which an electron has been incident outputs a signal dependent upon said arrival energy.

19. A method as claimed in any one of claims 15 to 18, wherein said electric field generator is operable to generate a voltage difference between said photocathode and said sensor which increases with time starting from a trigger point.

20. A method as claimed in claim 19, wherein said voltage difference is a periodic signal.

21. A method as claimed in claim 20, wherein said periodic signal has a frequency of between 0Hz and 1000Hz.

22. A method as claimed in any one of claims 15 to 21, wherein said electric field generator is operable to generate a voltage between said photocathode and said sensor of between 5kV and 10kV.

23. A method as claimed in any one of claims 15 to 22, comprising an attenuator disposed to attenuate photons arriving at said photocathode.

24. A method as claimed in any one of claims 15 to 23, wherein said photons have a wavelength between 10nm and 1000nm.

25. A method as claimed in any one of claims 15 to 24, wherein said photocathode and said sensor are formed as a sealed structure substantially having a vacuum between said photocathode and said sensor.

26. A method as claimed in any one of claims 15 to 25, wherein said method is part of a method of fluorescence lifetime imaging.

27. A method as claimed in any one of claims 15 to 25, wherein said method is part of a method of detection for time-of-flight measurement of photons for non-invasive IR imaging.

28. A method as claimed in any one of claims 15 to 25, wherein said method is part of a method of single shot time correlated single photon counting.